The Virtual Heliospheric Observatory

VHO

Preliminary Designs

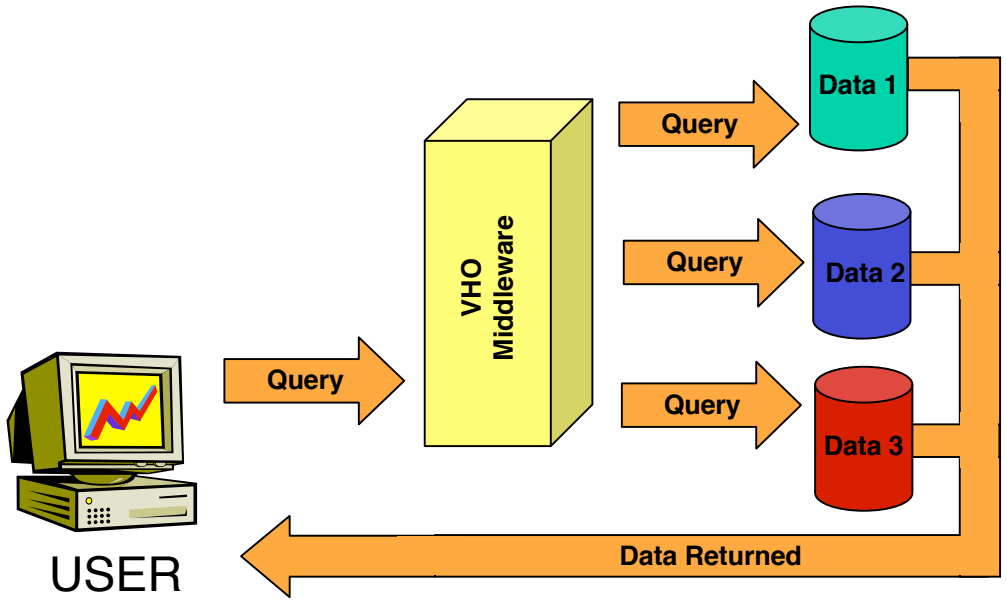
Adam Szabo
NASA Goddard Space Flight Center

The Vision

A New Data Environment:

The Virtual Heliospheric Observatory (VHO) is a thin middleware layer that allows uniform, user-friendly data discovery and query on existing and future NASA Sun Earth Connection (SEC) distributed heliospheric data sets.

- See what the PIs see
- Have access to the same tools



Why do we need a new environment?

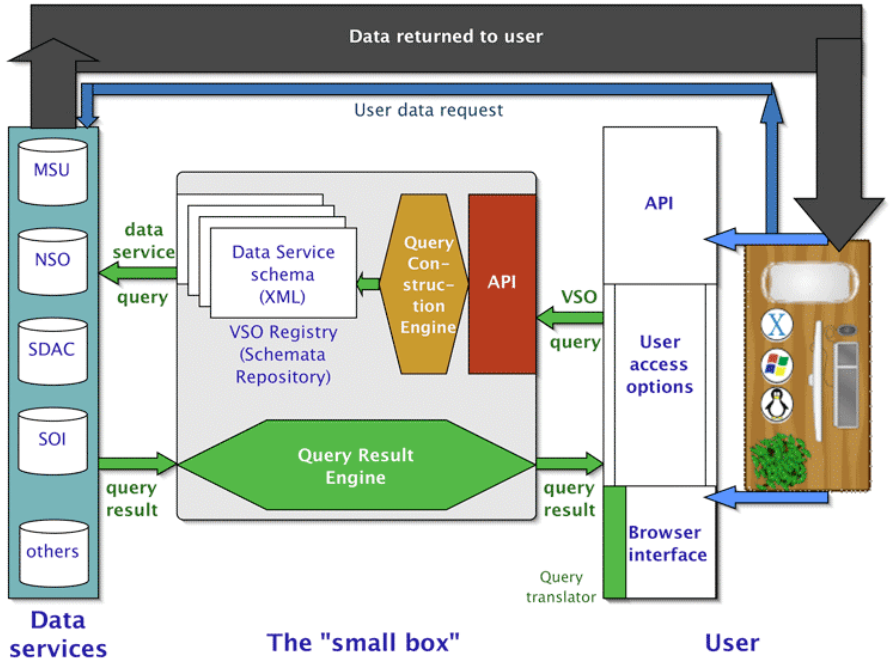
- Data sets reside on a large number of different systems.
  (e.g., NSSDC, ASC, PDS, PI sites)
- Data sets use very different formats with limited metadata.
  (e.g., CDF, HDF4,5, FITS, ASCII, Binary, IDL save)
- Data sets have different access methods.
  (e.g., HTML, FTP, SCP, SOAP)
- Different versions of the same data products are served
  from different sources.
- Limited number of joint, added value data sets.
- A common tool set is almost non-existent.

What is the goal of VHO?

- Need access to the same data products and tools what the PI teams use.
- Need open public access to data rapidly.
- Need a simple, unified method of access to all data sets and tools.
- Need to develop the new system in a reasonable amount of time and cost.

What Should the VHO Look Like?

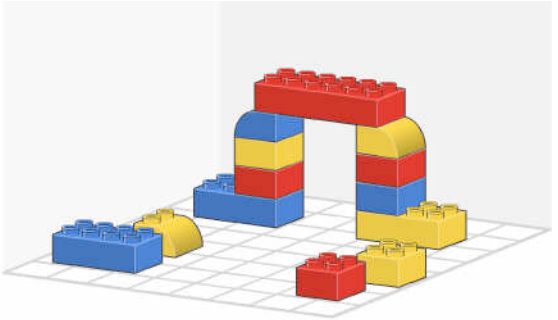
- Rapid access + PI site tools
  → Distributed System
- User-friendly unified access
  → Middleware
- Timely and cheap
  → without reprocessing (metadata)
  simple, expandable system

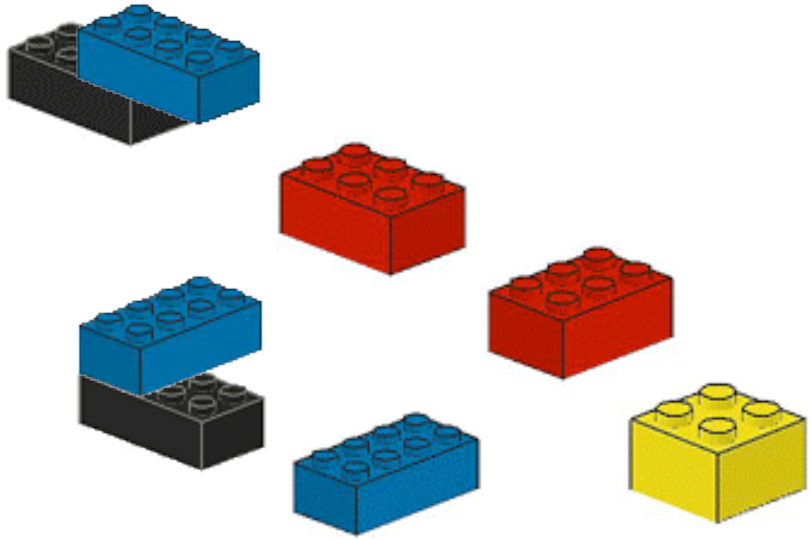


Planed VSO Architecture

Design Philosophy

- Separate the building elements
  - Data Services
  - Middleware
  - Analysis Tools
- Prototype with limit number of data products and capabilities
- Publish (share) design and all documentation
- Make system extensible
- Add new capabilities with competition and peer-review process

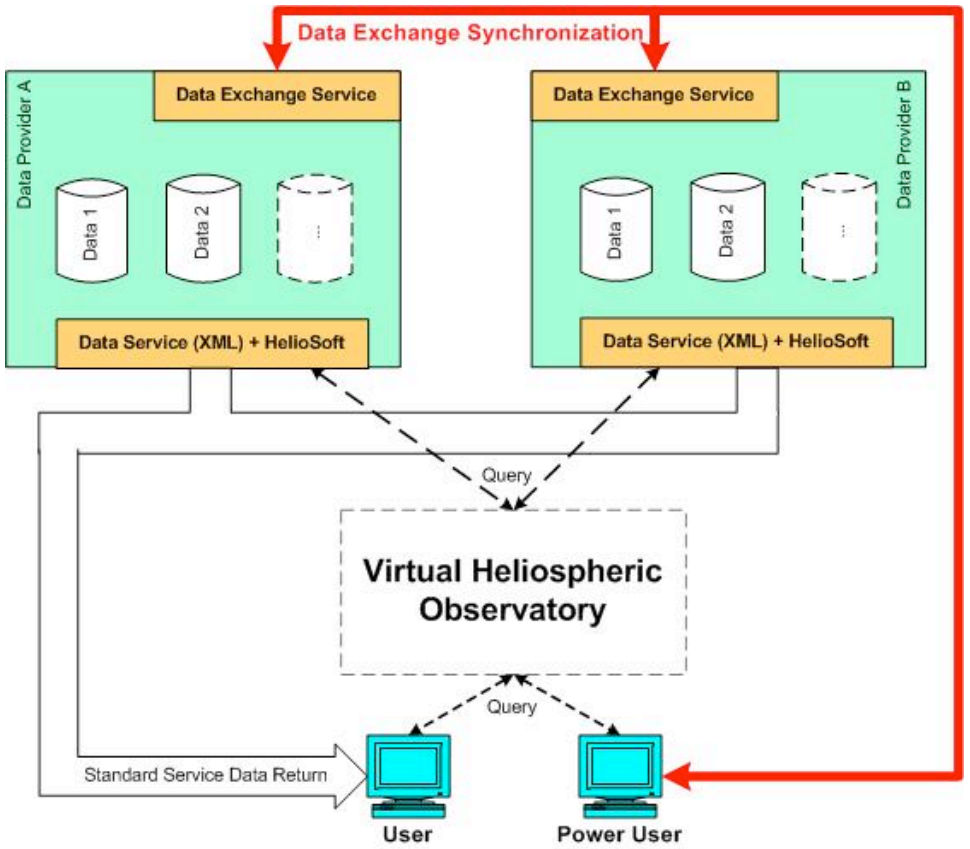




How Do We Get There?

Enable data service sites.

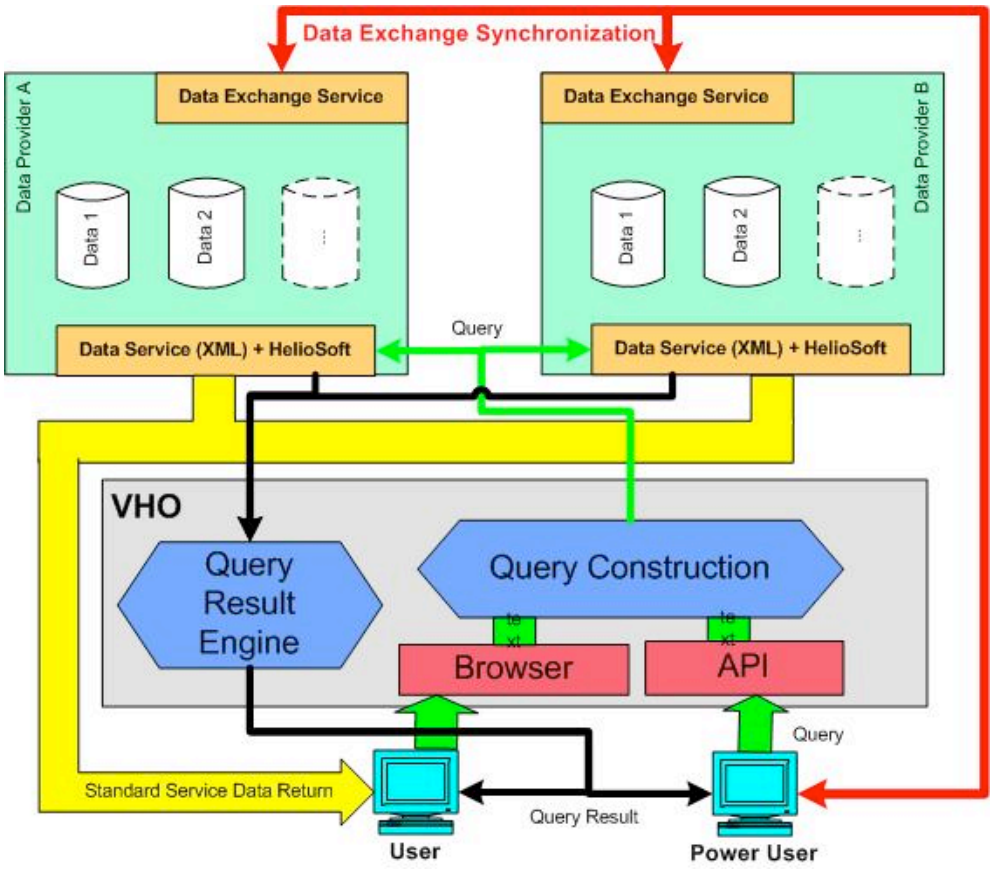
- Metadata development
  - requires a dictionary
    will use SPASE+
- Automated data exchange
  - allows version maintenance
  - allows cross calibration
  - allows merged data products
- Develop tool library.
- Prototype it on a small number of existing data services.



Prototype VHO

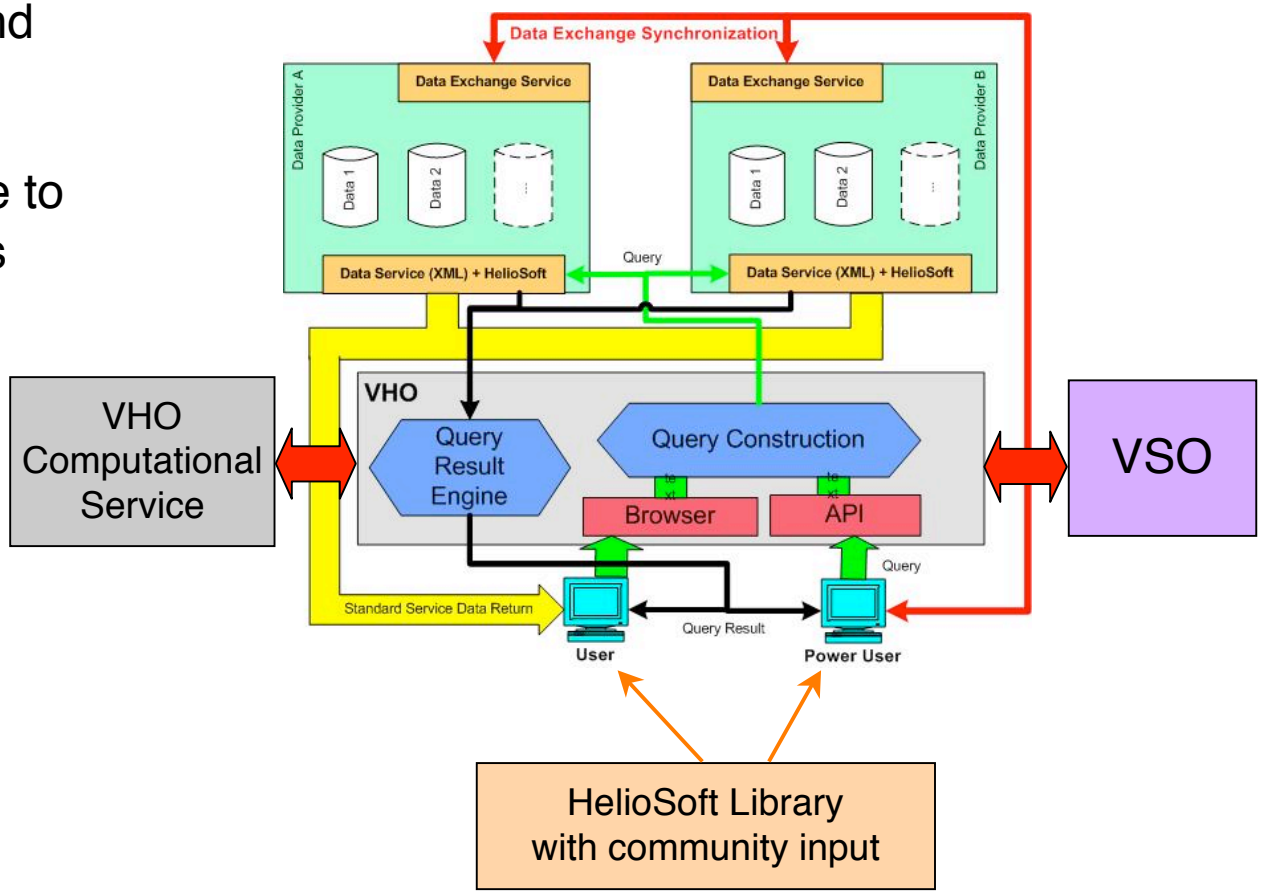
Build middleware.

- VHO allows simple browser type query.
- VHO allows complex direct API interface.
- Query construction and result processing.
- Data is directly returned from providers.
- Two, synchronized middleware to reduce bottleneck.



Full VHO Concept

- Connect VHO to VSO and other VxOs to eliminate duplication.
  → VxOs need to be able to pass queries and results between each other.
- Add VHO computational services to merge, reaverage, etc. the returned data.
- HelioSoft tool library. Uniform data model.



Who Is Going To Do It?

- Enable existing data service sites to achieve common goal.
  - Data expertise and infrastructure already there.
  - Minimal incremental funding required.
  - Science participation in data management.

- Support from small VHO team.
  - Setup expertise, middleware maintenance and development

- Evolve in response to user needs.

- Will have peer-reviewed process for elements of the environment.

- Development already started on the grass-roots level.

BACKUP

Why Should STEREO Care?

- Satisfies the NASA open data policy requirement.
- Enable cross-calibration between the two spacecraft and instruments.
- Simplifies combination of STEREO data with near-Earth assets (ACE, WIND).
- Enable multi-spacecraft science.
- Provide access to the HeliSoft library.
- Provide uniform access to the scientific community.
- Requires minimal effort.

VHO Development Team

- Current VHO team members:

Andrew Davis	Caltech	ACE/ASC
George Ho	APL	ACE, WIND energetic particles, composition
Fred Ipavich	U. Maryland	SOHO in-situ plasma
Justin Kasper	MIT	WIND, IMP 8, Voyager plasma
Davin Larson	Berkeley	WIND, LP, RHESSI, plasma, energetic part.
Tom Narock	L3/GSFC	Distributed data systems
Aaron Roberts	GSFC	Helios, modeling, visualization
Peter Schroeder	Berkeley	STEREO
Ruth Skoug	LANL	ACE, Ulysses plasma
John Steinberg	LANL	Genesis, ACE, WIND plasma
Adam Szabo	GSFC	WIND, IMP 8, Voyager magnetic field, plasma
Jon Vandegriff	APL	High-energy particles, data models

- Role of VHO Team:
  - Setup expertise, middleware development and maintenance.
  - Data and system expertise and most of infrastructure already there.

- Unfunded team – only minimal funding required.

- White paper coming soon + need community input.